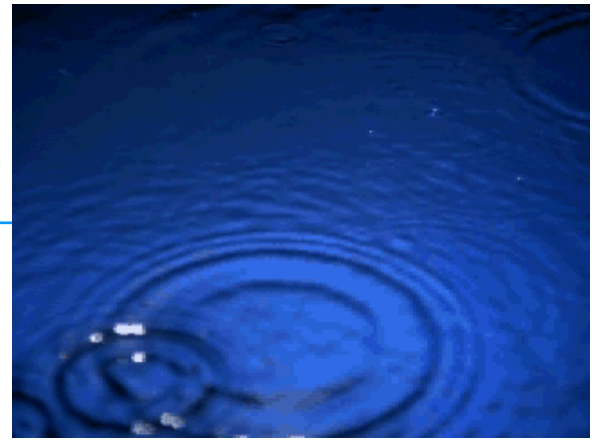
NASDA's Partnering Interest and H-IIA Launch Vehicle

System Requirements Review



June 4 - 5, 2002

Riko Oki
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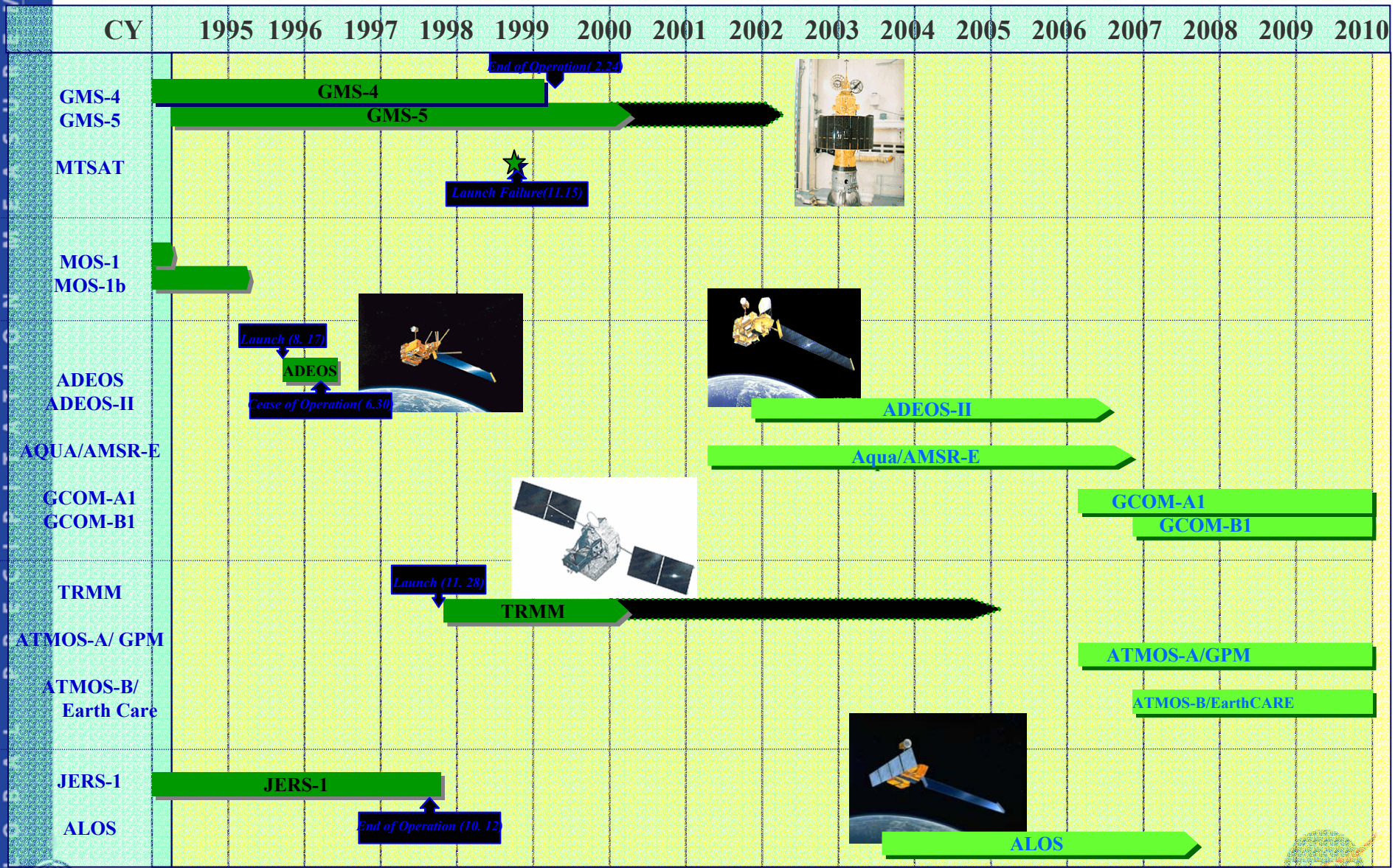
NASDA/SPPD

NASDA's Earth Observation Satellite Program

As of Jan 2002



GPM study status in NASDA

- ***JFY2002: increased to three times from JFY2001 for Phase A study***
- ***Requesting budget to start phase B study in JFY2003. Supposing a dual launch with GCOM-A1 in 2007.***
- ***NASDA's study on the GPM***
  - *DPR development study*
    - *Ku-band radar phase A study by NASDA.*
    - *Ka-band radar phase A study by CRL*
  - *H-IIA dual launch study*
  - *Ground system design study*
    - *DPR data processing including DPR algorithms and DPR/Microwave Radiometer algorithms*

Precision brought by DPR

- High sensitivity to detect light rain and snow
- Accurate estimation of rainfall rate
- Separation of snow from rain
- Progress in cloud physics

Global rain map in every 3 hours by GPM

- Climate change assessment

  monitor variations in rainfall and rain areas associated with climate changes and global warming

- Improvement in weather forecasts

  Quasi-real-time assimilation of data in numerical prediction models,

  Improved flood prediction

- Water resource management

  river, dam, agricultural water, etc.

- Agricultural production forecasting

- *Science team in Japan*
  - *GPM algorithm study*
    - *DPR algorithm*
    - *DPR/MWR combined algorithm*
  - *Precipitation system and climate study*
  - *Study for operational use*
    - *Weather forecast*
    - *Water resource management*

Promotion for Water cycle study

CEOS&IGOS

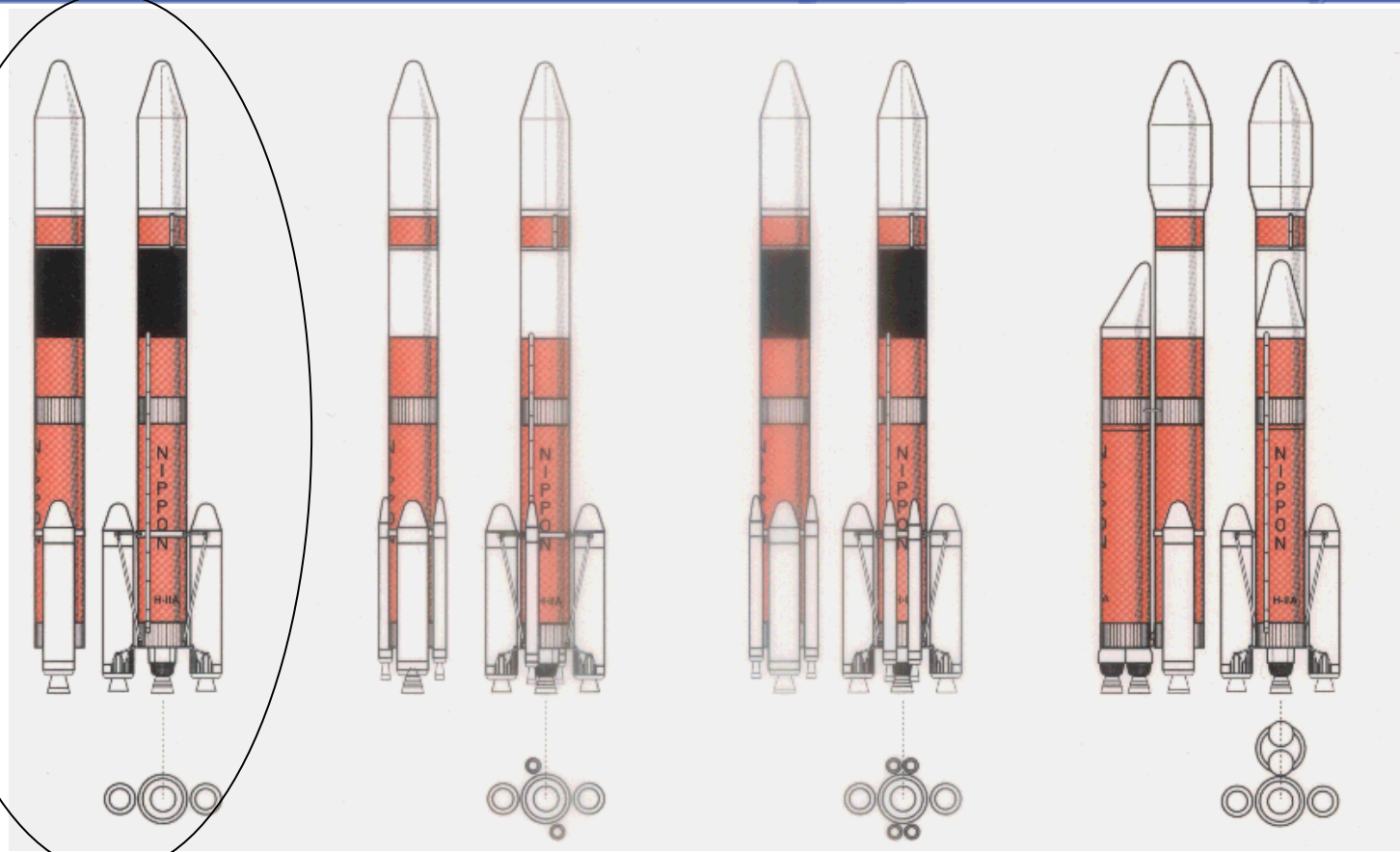
- NASDA was 2001 CEOS Chair and IGOS-P Chair.
- CEOS Plenary#15 and IGOS-P#8 held in Kyoto, Nov 2001 approved IGOS Water Cycle Theme and CEOP (Coordinated Enhanced Observing Period) as its precursor project.
  - Current IGOS Themes: Ocean, Carbon Cycle, Atmospheric Chemistry, Water Cycle

WSSD (World Summit for Sustainable Development)

- Significant efforts to link CEOS to international conventions, to build demand for EO programmes
  - ESA(2002 CEOS Chair), NOAA and NASDA leading CEOS efforts for WSSD 2002
  - Prepcom II,III meetings, NY / Prepcom IV, Indonesia – late May
  - "Water cycle monitoring", "satellite and remote sensing" are included in WSSD Chair paper draft.
  - All CEOS members urged to contact national delegations to build support
- CEOS efforts planned for Johannesburg

WWF (World Water Forum)

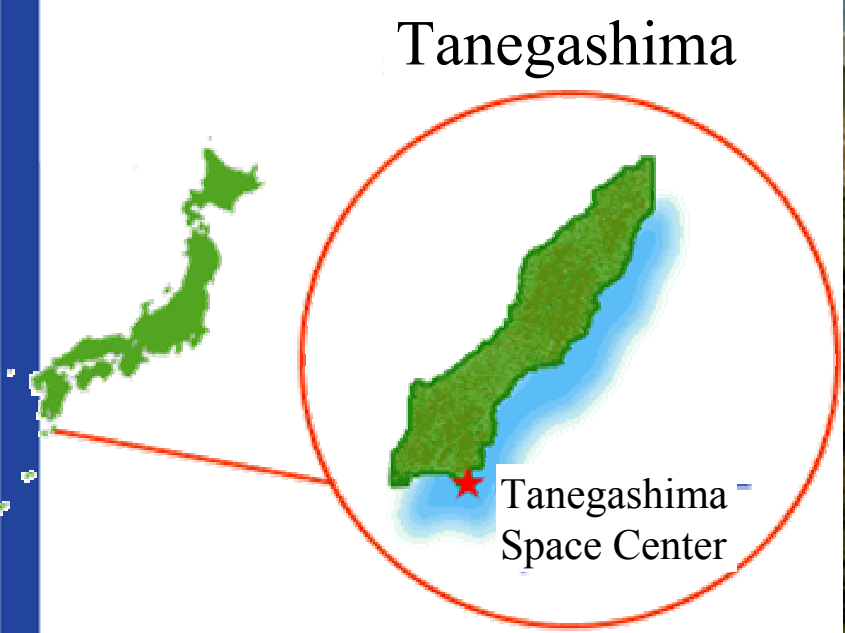
- March 16-23, 2003 in Kyoto, Japan
- GPM joint session by NASA and NASDA



GPM

- ✓The standard vehicle can launch a 4-ton-class payload into geostationary transfer orbit (GTO), as same as H-II.
- ✓The augmented vehicle can launch a 7-ton-class payload into GTO by simply adding a large liquid rocket booster to the standard vehicle.

H-IIA Launch Site (Tanegashima Space Center: TNSC)



Launch Plan of H-IIA

JFY	Type	Satellite
2001*	standard	Test launch
2002*	standard	MDS-1
2002	standard	DRTS
2002	standard	ADEOS-II
2003	standard	IGS #1
2003	standard	MTSAT
2003	standard	IGS #2
2004	standard	ALOS
2004	standard	ETS-VIII
2005	augmented	Test launch
2005	standard	SELENE
2005	augmented	HTV Technology Demonstrator
2005	standard	WINDS
2006	?	?
2006	?	?
2006?	standard	GPM?

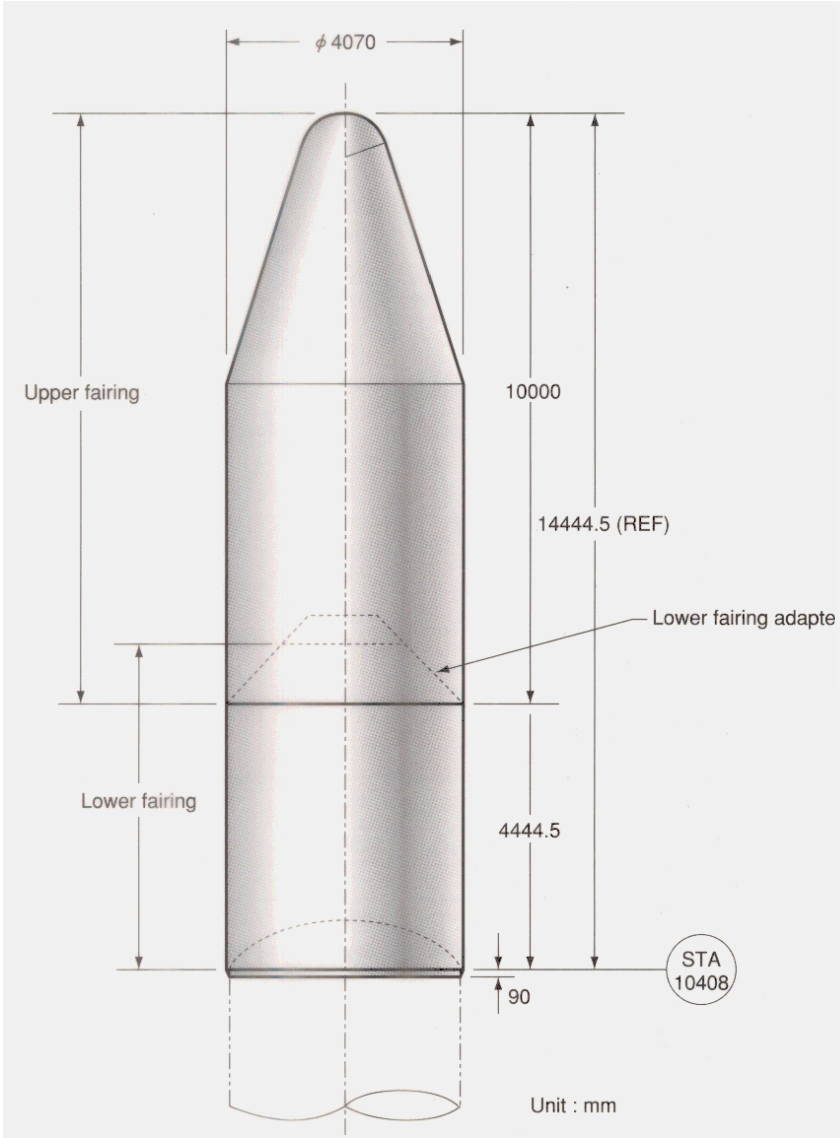
*: Already launched successfully

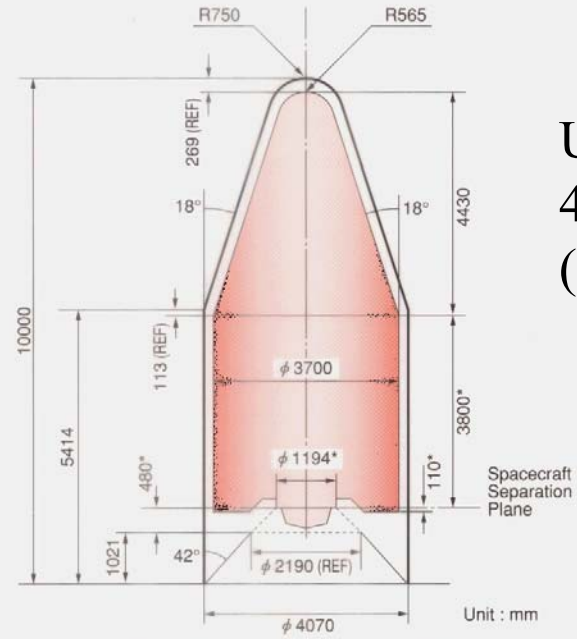
Payload fairings for H-IIA

Item	Launch	External			Usable volume		Application
Model		Height (m)	Diameter (m)	Portion of fairing	Height (m)	Diameter (m)	
4S	single	12.0	4.07		10.23	3.7	ETS-VI, COMETS
5S	single	12.0	5.1		9.12	4.6	ADEOS ADEOS-II
4/4D-LS	dual	14.5	4.07	upper	8.23	3.7	TRMM
				lower	3.80	3.7	ETS-VII
4/4D -LD	dual	16.0	4.07	upper	8.23	3.7	None
				lower	5.36	3.7	None
5/4D	dual	14.1	5.1/4.07	upper	6.70	4.6	SFU
				lower	4.68	3.7	GMS-5

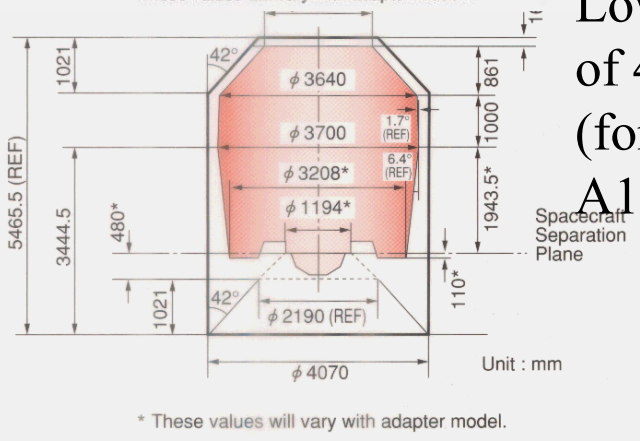
Based on H-IIA User's Manual 2nd Ed.

Fairing (type 4/4D-LS)





Upper fairing of 4/4D-LS (for GPM/Core)



Lower fairing of 4/4D-LS (for GCOM-A1)

Launch Vehicle for GPM Core (plan)

- ***H-IIA 202 (standard type, GTO 4.1t)***
- ***Fairing: 4/4D-LS (same as TRMM)***
- ***Dual launch with GCOM-A1***

ADEOS-II (Launch in 2002)

- H-IIA 202 (standard type, GTO 4.1t)
- Fairing: 5S (same as ADEOS)
- Single launch (altitude 800km, circular orbit)

Analysis of launch of H-IIA for GPM+GCOM-A1

Assumption	Launch: 2007 Orbit: 400x650km Elliptical orbit Rocket: H-IIA202-4/4DLS Mass of PAF: 100kg x 2

Mass allocation (kg)

Inclination	*GCOM-A1*	*GPM*	*Contingency*
68 (H2A202)	*1350*	*3000*	*-650*
65 (H2A202)	*1350*	*3000*	*300*
68 (H2A2022)	*1350*	*3000*	*-400*
65 (H2A2022)	*1350*	*3000*	*650*

Analysis of launch of H-IIA for GPM+GCOM-A1

- ✓ Dependency on inclination angle mainly comes from the consumption of extra fuel to avoid to fly over populated area such as New Zealand and Brazil.